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Summer 2000 Volume II, Issue 2

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Directorates welcome new directors

by Rex Swenson, Munitions Directorate

EGLIN AFB, FLA. — Both the Munitions Directorate and Sensors Directorate of the Air Force Research Laboratory received a change in "direction" this summer with the announcement of new directors.

Colonel Harry "Dutch" Dutchyshyn Jr., director, of the Air Force Research Laboratory Munitions Directorate, relinquished command to Col. Thomas "Mas" J. Masiello in a change of command ceremony conducted at the Eglin Conference Center July 6.

In addition, the Sensors Directorate at Wright-Patterson welcomed director Dr. Donald W. Hanson, who had previously been acting director of the directorate, when he moved permanently from his position as senior scientist for photonics to that of director on August 13.

Masiello comes to the Munitions Directorate from an assignment as the commander of Eglin's 40th Flight Test Squadron. In his new position he will direct more than 400 military, civilian, and contractor personnel who develop,

(SEE MUNITIONS/P.4)

WELCOMING A NEW DIRECTOR — Brigadier General Paul D. Nielsen (left), Commander of the Air Force Research Laboratory, passes the flag to Col. Thomas Masiello during a change of command ceremony.

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https://intra.afrl.af.mil/news/

Directed Energy laboratory gets new senior reservist

by Barbara Baca, Directed Energy Directorate

KIRTLAND AFB, N.M. — Colonel Susan Wilkerson recently took over on as the senior Individual Mobilization Augmentee (IMA) for Dr. R. Earl Good, who heads the Directed Energy Directorate of the Air Force Research Laboratory.

Wilkerson replaced Colonel Jerry Bolme, who has served as the senior IMA in the directorate since November 1998. Bolme retired in late April.

As the directorate's top reservist, Wilkerson — during war or a national emergency — could be called upon to manage the directorate in place of Good, who would be free to handle other priority issues.

Wilkerson has been in the Air Force, on both active duty and in a Reserve capacity, for twenty years. She began her career as a senior staff scientist at the Air Force Geophysics Laboratory in Sunspot, N.M. Most recently, she had been creating self-paced training programs for the directorate's Optical Surveillance Division.

Throughout her Air Force career she has worked in a variety of scientific and technological areas.

In her civilian career, Wilkerson has worked for several companies in various technical capacities, which include optical systems analyst, integrated product team lead, and training developer and programmer.

Currently, she is a principal engineer at Raytheon Systems Company in El Segundo, Calif.**@**

Find additional Fe@tures on the web.....

Lab tests satellite vulnerability to lasers

Directorate unveils advanced research laser facility

AFRL commander addresses school groundbreaking

Munitions lab conducts successful JDAM wing test

Compact research satellite to test new technologies

Test examines effects of atmosphere on laser beam

by Rich Garcia, Directed Energy Directorate

KIRTLAND AFB, N.M. — To the casual observer, it seemed easy enough: Take an Air Force plane and use it to find out what the atmosphere would do to a beam of laser light fired over a long distance.

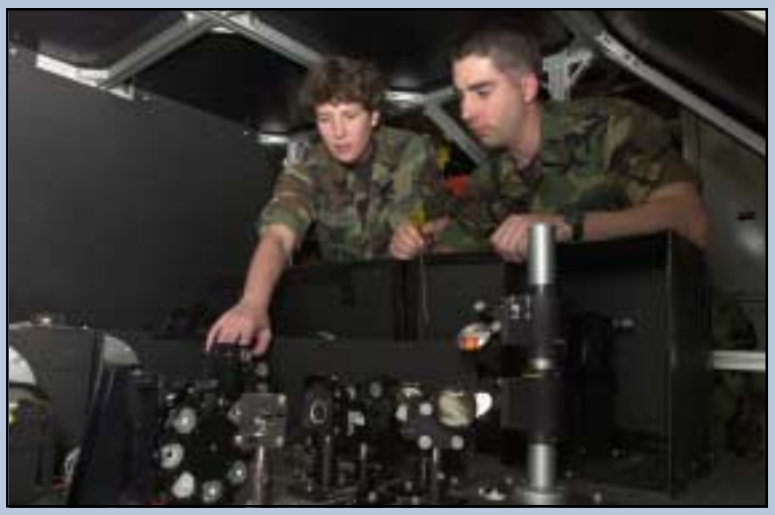
That plane has just returned and the job was more involved than it sounded. It took 54 people from nine organizations, a month and a half away from Kirtland AFB, more than 150 flying hours over six countries, and operating two very sophisticated sensors.

Officials at the Air Force Research Laboratory's Directed Energy Directorate expressed satisfaction with the test series. The collected data thus far indicates that the effects of the atmosphere will not adversely affect a laser beam more than anticipated. This is welcome news for the Airborne Laser – a jumbo jet that will carry a laser capable of destroying missiles from hundreds of miles away. This means the warbird's laser will not be hampered by the atmosphere over the ranges for which it is designed.

At the heart of the tests were two unusual instrumented systems: a stellar scintillometer and an anemometer. Both of these sensors were needed to gather the accurate data needed.

"Flying at altitudes between 39,000 and 47,000 feet,

(SEE LASER/P.5)



TWO HEADS ARE BETTER THAN ONE — Major Kim McCrae (left), chief of the Airborne Laser Tech Branch, and Capt. Jason Gale, chief of Systems Engineering, check the alignment on a stellar scintillometer. The scintillometer focuses on individual stars, processing the light from those stars . Information from this sophisticated sensor helps to determine to what extent the atmosphere might distort.

Student projects reach final frontier, laboratory helps

by Timothy Anderl, AFRL Headquarters

WRIGHT-PATTERSON AFB, OHIO — Students from three states recently practiced foresight and imagination that may someday change long duration space flight and life on earth. The students were invited by the Air Force Research Laboratory Materials and Manufacturing Directorate to submit their projects to be tested in outerspace.

The directorate is leading a program to send experimental materials tests up to the International Space Station to test them in the space environment and donated the additional room in the experiment trays to students for their own experiments.

The public received a chance to see student science experiments designed to fly on the space station as part of the project called Materials on the International Space Station Experiments or (MISSE) on June 8 at the United States Air Force Museum's Kettering Hall. The project is a joint effort between the lab's Materials and Manufacturing Directorate, the Wright Patterson AFB Educational Outreach Office, NASA and Boeing.

The students were challenged to identify one of the problems associated with long duration space flight, and designed a passive experiment that could be used to help solve the problem and could also be used to improve a condition of life on Earth. Sixty ideas from 20 schools were submitted and 28 projects were selected.

"Young people have an amazing talent for using their imagination," said Dr. Wade Adams, chief scientist at the Materials and Manufacturing Directorate. "These students imagined what 'could be' and then changed it into a reality."

Students, who ranged from kindergarten to twelfth-grade, received guidance from their teachers and mentors from the Materials and Manufacturing, and Human Effectiveness directorates during the research process.

Students from Incarnation School in Centerville, Ohio said that representatives from the lab demonstrated several environments characteristic of space for them to consider while working on their projects. Scientists used a shaving cream can to demonstrate the properties of a vacuum and liquid Nitrogen to demonstrate the temperature difference in space.

One such project from Incarnation, called "Silly Science," organized experiments that will test the elasticity, bounce and pliability of hot glue, silly putty and caulking when exposed to the space environment for a period of time. In the students' hypothesis they wondered if the substances would change in form due to temperature, radiation, microgravity or vacuum conditions.

During experiments they conducted prior to launch, one second-grade student said, "We took specimens of hot glue, silly putty and caulking, attached them to a clamp, tied weights on the end to see how long it would take them to break." We want to know if [the substances] could be used to fix leaks in space."

Students involved in the project also admitted being curious about whether their silly putty would be "bouncy" after spending

(SEE MISSE/P.5)

Munitions (from page 1)

integrate, and transition the science and technology for air-launched munitions.

Masiello entered the service through the United States Air Force Academy where he was a distinguished graduate and earned a bachelor's degree in electrical engineering. Upon graduating from the Air Force Academy, he entered undergraduate pilot training at Williams AFB, Ariz.

He earned a master's degree in aeronautical science from Embry Riddle Aeronautical University.

In 1996, Masiello became the Operations Officer for Eglin's 39th Flight Test Squadron. He managed and conducted weapons/avionics testing on F-16 aircraft and oversaw the development testing of smart weapons such as Joint Direct Attack Munition and the Joint Stand-Off Weapon. Colonel Masiello assumed command of the 40th Flight Test Squadron (FTS) in July 1999 and the 39th FTS in August 1999. Then in September 1999, the 39th FTS and 40th FTS merged to become the 40th FTS.

Hanson became involved in the Air Force science and technology field upon his graduation from Rochester Institute of Technology with a Bachelor of science degree in electrical engineering in 1968. He began as part of the technical staff in the Electronic Counter Countermeasures and Navigation Branch of the Rome Air Development Cent (RADC) at Griffiss AFB, N.Y.

In 1973 he received his Master of Science degree in electrical engineering from Syracuse University and became a technical staff member of the Electro-Optical Surveillance Division of RADC.

During his time with RADC, Hanson received his Doctor of philosophy in electrical engineering from Syracuse.

In 1990, Hanson was appointed to the Senior Executive Service as the director of the Surveillance Directorate at the Rome Laboratory. In 1997, Hanson was appointed a member of the scientific and professional cadre of senior executives as the senior scientist for photonics.

Hanson's principal technical fields of interest are photonics, radar and adaptive optics. **@**

Consortium stimulates telecommunication in New York, Rome lab teams with leading technology organizations

by Fran Crumb, Information Directorate

ROME, N.Y. — The Air Force Research Laboratory Information Directorate has joined with two other leading central New York technology organizations to form a telecommunications research consortium dedicated to improving regional telecommunications and stimulating the area's economy.

The New York Advanced Communications Environment (NYACE) is being established at Syracuse University to advise community organizations about new communications technologies, and to experiment with technologies for strengthening the telecommunications infrastructure in the Syracuse and Utica-Rome areas.

Besides the AFRL Information Directorate, the consortium includes the New York State Technology Enterprise Corporation (NYSTEC) and the Syracuse University Community and Information Technology Institute (SU/Citi).

"Investment in our telecommunications infrastructure is essential for more efficient delivery of government services and a stronger central New York economy," said project manager Steve Mercurio of NYSTEC. "The purpose of NYACE is to advise government agencies about new communications technologies that can improve their operations and make agencies more accessible to constituents.

"What began as a telecommunications study to connect far-flung state agencies and departments has been expanded to encompass several possible initiatives to improve the economy and quality of life in the central New York region," said Raymond P. Urtz, director of the Information Directorate.

"A new fiber-optic network being installed along the length of the New York State Thruway will form the basis for a pilot project to extend the new, high-speed state government intranet in a 30-mile radius around both Syracuse and Utica," said Urtz. "The NYACE initiative also envisions a statewide distance learning project to provide continuing education classes for public and private-sector employees."

New technology will allow classes to be taught by college and continuing-education faculty members in subjects such as language, communications, financial management, technology basics and citizenship. New Yorkers would be able to take these courses via the Internet from home, work or community centers.

The idea for the consortium was born out of a series of recommendations the organizations made to the state in a comprehensive study called the New York State Advanced Telecommunications project. NYSTEC spearheaded the study, which examined the state government's existing telecommunications infrastructure and recommended more effective uses for new technologies. Due to the ever-evolving nature of telecommunications and computing, NYACE is being formed to provide state and local government with ongoing assessments of emerging technologies.

"Consortium members have a wealth of regional expertise in telecommunications, computers and high-speed networks," said NYSTEC's Mercurio. "Each of our organizations is also extremely interested in local economic development. Much of the advice we can give to state agencies can also be applied locally in Syracuse, Rome and Utica."

NYACE partners hope to eventually see the latest innovations in communications and computing introduced earlier in central New York, rather than several years after introduction into major markets like New York and Boston.

"If central New York can obtain these cutting-edge technologies sooner rather than later, it will be easier to attract new businesses to the area and help our existing companies gain a competitive advantage," Mercurio said. **@**

Laser (from page 3)

we used the scintillometer to focus on individual stars," said 1st Lt. Dawn Grover, the test program manager. "The scintillometer processed the returning light from those stars to help determine to what extent the atmosphere might distort a beam of laser light."

According to 1st Lt. Patrick Kelly, a flight test engineer on the program, the second piece of equipment — an anemometer — collected "outside" information at the rate of 6,000 samples per second. "Its most distinctive feature," said Kelly, "is a set of four-pronged wires, about the thickness of a human hair, that protrude from a housing beneath the nose of the aircraft. These sensors measure the temperature and velocity of the air through which the plane is flying. Incredibly sensitive, this sensor can detect temperatures to within 1/1000th of a degree while the plane is flying 475 miles per hour."

Although the plane spent time in Alaska, England, Japan and Singapore, the majority of testing took place in Doha, Qatar, in the Middle East, and in the Republic of Korea's Osan Air Base in the Far East. This was the third of three data-collecting campaigns in these areas. Each trip has been at a different time of the year, to see how the data might vary during different seasons.

The test plane, a modified Air Force C-135E aircraft named Argus, is owned and flown by a crew from Detachment 2 of the 452nd Flight Test Squadron at Kirtland AFB. Its management comes under AFRL's Active Remote Sensing Branch.

Among the other organizations that provided support were balloon specialists from AFRL at Hanscom AFB, Mass. They gathered atmospheric data, but from sensors carried aloft by large, high-altitude balloons.

Argus is a specially-instrumented C-135E aircraft, designed as a flying laboratory to gather a wide variety of data. It carries electro-optical sensors that can be tuned to gather technical information across the light spectrum (visible, ultraviolet, and long-wave infrared). Its sensors can collect radiometric imagery, spectroscopic data, and measure atmospheric turbulence. Airborne light detection and ranging systems can be installed for remote sensing of the atmosphere. The aircraft can be adapted for any flying experiment up to 20,000 pounds **@**

MISSE (from page 3)

time in space.

Cynthia Duckro, a teacher at Incarnation also seemed visibly impressed by the voracious appetites of her students who "are really just beginning their interest in science. She said she was also impressed by the expertise of Kenny Johnson, Jim Mazza and Brett Bolan from the Materials and Manufacturing Directorate who mentored groups from the school.

Another group of students from HK Ankeny Middle School wanted to know if grain stored in space would remain free of bacteria, insects and fungi.

"We learned about the project about mid-way through the year when our teacher asked for volunteers," said a seventh-grader from Ankeny. "Since then we've looked at samples through an electron scanning electron microscope, done research from the internet and conducted experiments. We've decided that [bacteria, insects and fungi] probably won't show up in our grain because of the vacuum and cold temperatures in Space – there are other factors that we aren't sure of though."

Dr. Adams said the experiments would be placed in Passive Experiment Carriers, which resemble a suitcase and will serve as a Space Environmental Exposure Lab. The cases will be launched into space where they will be exposed to ultraviolet, atomic oxygen and radiation effects. The experiments will also be exposed to conditions characteristic of much higher orbits because they will be in space during Solar Max, an active peak of the 11-year sun cycle.

When the projects return from their trip, the Educational Outreach Office will work with mentors and students to analyze the results and complete the research. Student teams will be kept together until projects return by events and activities planned by the Outreach Office.

The projects will be taken to the International Space Station aboard the space shuttle as early as June 2001 and will remain for a period of one to three years. Control experiments will be maintained at Wright-Patterson AFB. **@**

IMAGINATION, EXPERIMENTS SOAR — Second-grade students from Incarnation School in Centerville, Ohio show off their project that will be included in the materials on the International Space Station Experiment. The students designed passive experiments that will be tested in space over the next three years.

@Columns

Commander's Corner

June 2000

Brig. Gen. Nielsen

It's been two months since the change of command here at AFRL and I'm slowly but surely winding my way through the directorates to see each of the sites and meet the great people that make up our laboratory. I wanted to take this opportunity to pass along some of my observations.

First, it is great to be part of this organization as we pave the way for the future of defense 10, 20 and 30 years from now. To me, there is no more important business within the Air Force than S&T. The Air Force is a service that grew out of S&T and we have the responsibility to develop the Air Force for the next generations.

As I travel to each directorate, I can tell you the most exciting draw at each location has been the people. Despite the numerous challenges of size and shape of the lab, the people within AFRL maintain their spirit and enthusiasm for doing great work for our Air Force. Military, civilians and contractors all demonstrate that excitement about the work they are doing with unmatched intensity.

As a former Rome lab commander, it was great to see my former Romans in New York and Hanscom — now members of the Information and Sensors directorates. I've also been awestruck by the great work being done at the Wright site directorates and the Space Vehicle folks at Hanscom. Our Air Force is fortunate to have such smart, sharp, dedicated men and women working for its future.

This week I'm off to Kirtland and I look forward to visiting our other sites as soon as possible.

It's been almost three years since we consolidated into AFRL. In that time the increased interaction among our directorates clearly demonstrates the benefits of one lab for Air Force science, research and technological development.

Cross-directorate interaction is essential today — integrated technical solutions are quickly transforming the Air Force and technological intersections are especially fertile areas for revolutionary advances. Reach out to the other directorates to understand the challenges they face, the technical solutions they may be able to offer you, and the novel approaches you may be able to offer them.

At each of my commander's calls I have been presenting ideas to remember as we go about our daily work within the lab. I think they bear repeating:

Our first job here at AFRL is to do great research and technology. This is why we exist as an organization and why so many of you have dedicated your professional lives to science and engineering. Help me make sure that the work environment we create helps us do great research rather than hinders it.

The best defense is a strong offense. We need to aggressively transition our technologies throughout the Air Force. In addition, we need to make sure people understand our value to the Air Force, DoD, and the nation. Together we need to promote our work and educate others so they understand AFRL is critical to the future of our Air Force.

AFRL needs to shine in every measurable way possible. In addition to the obvious measures like superb science, tantalizing technology and tremendous transitions, we need to execute our business well, manage our support costs and infrastructure professionally, and develop our men and women and recognize them for their accomplishments.

And let's make sure we take care of ourselves — physically, emotionally, and professionally. Whether it's our cycle ergometry test or the quality and timeliness of our performance reports and awards, let's lead AFMC and the Air Force.

AFRL and I need the hearts and minds of all 6,000 of us focusing on our goal of doing great research and technology. It is too big a job for any one person to do and we are so much stronger with all of our vectors pointed in a common direction.

We need to make sure we have balance in our overall program including long-term research efforts, near-term transitions for our warfighters, and a willingness and tolerance to take on risks for potentially high payoff, "out of the box" programs. We are the shepherds of Air Force S&T, the visionaries for the Air Force of the future. It's a big responsibility, a great opportunity.

As individuals we need to take care of our families, our communities and ourselves. Don't forget to spend time outside the lab giving back to the communities in which you live. And have fun! The average person works about 2,000 hours per year at work. That is a tremendous amount of time over a 20 or 30 year career. You'll maintain your enthusiasm and productivity better if you enjoy what you do.

That's it. I look forward to seeing you in action at the remaining sites. It has been a great two months….thanks for making the lab the best place to be in the Air Force. **@**

@Columns

CIO Topics

Identifying weak passwords controls system access

by Larry Johns, Air Force Communications Agency

Information Assurance begins with some basic requirements. A key element in controlling access to information systems is the requirement for all users to provide some form of identification.

Currently the primary means of doing this is for the user to provide a user ID and password. The password provides the first line of defense for our information systems, and that defense is weakened by poorly constructed passwords.

Air Force requirements for password construction and selection call for passwords to have a minimum number of alpha-numeric characters (upper and lowercase, and at least one special character). System administrators have the availability of password-cracking tools to identify the use of weak passwords. Unfortunately, these tools are not normally used until the password has been in use for some time.

The Air Force is evaluating the use of a password policy enforcement tool that will check passwords as the user initially enters it into the system. Direct feedback is immediately available to the user when the entered password does not meet the requirements, or when the entered password is listed in the tool's accompanying dictionary.

Password cracking tools typically check the password against a dictionary to determine if a match can be found. In some cases the tool will check variations of the dictionary words by adding a letter or number to the beginning or end. The more sophisticated tools use a combination of the dictionary check and then have the capability to complete an exhaustive attack of the password.

Exhaustive attacks involve the submission of as many different password values as possible in the hopes of finding one or more which are valid. The work factor for someone attempting an exhaustive attack is directly related to the number of possible values, which must be tried for each character of the password.

The following illustrates the increased difficulty of cracking passwords when using properly constructed passwords. Using the 26 letters of the English alphabet in any arbitrary arrangement, the number of possible passwords that can be formed using N letters is 26 to the Nth power. The total number of passwords comprises the password space. Thus, using 5-letter passwords, there would be 26 to the 5th possible combinations, which is equal to 11,881,376.

This is fairly easy for a password cracking tool using an exhaustive attack to try all the combinations in a relatively short time. Increasing the password length to eight characters will increase the number of combinations to 208,827,064,576. This significantly increases the time required for the tool to try all the combinations. The addition of upper case letters, 10 numeric digits, and the possibility of 25 or 30 easily inserted special characters will increase the number of combinations to a gazillion or two (more than I can figure or comprehend). This number will significantly increase the time required for the cracking tool to try all the combinations.

Still, it's not an impossible task given enough time and computing power, but this should be enough to discourage casual intruders. Adding numerics and special characters also makes it more difficult to discover passwords when checked against a dictionary. Do your part to help protect our information systems by following the rules for properly constructed passwords. **@**

Top E-mail and Network Use Do's and Don'ts
(These apply to military, civilians and contractors)

1. Do not open e-mail attachments from senders you don't know.
2. Do not send FOUO, Privacy Act data or classified information on unclassified e-mail systems outside the base security boundary. (Note: the governing policy AFSSI 4100 is being rescinded and new rules are coming.)
3. Do not send or receive e-mail for commercial or personal financial gain using government systems.
4. Do not send harassing, intimidating, abusive or offensive material to or about others.
5. Do not cause congestion on the network by such things as propagation of chain letters, broadcasting inappropriate messages to groups or individuals, or excessive use of data storage space on the e-mail host server.
6. Do use passwords with a minimum of 8 alphanumeric characters, using upper and lower case, at least one number and special character. (Recommendation is not to have a numeric in the first two characters or the last two characters.)
7. Do use approved anti-virus software that automatically scans daily and scan all downloaded files from disk, Internet, or via e-mail. Be sure to update signature files regularly – this will help your anti-virus software stop the latest new viruses!
8. Do use a password protected screensaver that automatically activates when the computer is unattended. (If this is not possible, ie. Macs, then have some methodology of locking the workstation.)

M e e t A F R L --

Brooks scientist crusades for transplants

by Rudy Purificato, 311th Human Systems Wing

BROOKS AFB, TEXAS — After what may have seemed like an eternity, a 7-month-old girl who had been "adopted" by a Brooks scientist recently received a liver transplant.

"She had been at University Hospital for weeks awaiting a transplant. I thought she was probably not going to make it," said Dr. Sharon Garcia, research psychologist for the Air Force Research Laboratory Human Effectiveness Directorate's Warfighter Training Division.

As a board of director's member for the nonprofit group Transplants for Children, Garcia knows too well the reality that exists for children awaiting transplants.

SHARON'S FRIENDS — The group of children pictured have received successfull organ transplants. Dr. Sharon Garcia, a research psychologist for the Human Effectiveness Directorate of the Air Force Research Laboratory is a board member for the nonprofit group Transplants for Children, a group that works to ensure children like the ones pictured receive much needed transplants.

Since TFC's inception, 56 children have died while awaiting transplants. Another 31 children did not survive medical complications following transplantations. According to TFC officials, some children wait an average three to four years for a kidney. For those who receive single organ transplants, the survival rate is 80 percent.

Garcia's 'transplant' child, part of a TFC program in which families with children needing or having had transplants are 'adopted,' is among the few lucky ones. She was near death when she received part of a liver donated by the family of a 15-year-old boy who had been killed in a car accident.

"When you're a kid, you don't understand the complexity of life when it goes wrong," Garcia said. This can also be true for many families of children needing transplants when they discover the overwhelming requirements associated with prolonged, life-threatening illness.

It was such a dilemma that prompted Eric and Sharon Sutton in 1986 to organize TFC in San Antonio following their unsuccessful efforts to secure a liver transplant for their young son. The Combined Federal Campaign organization's primary purpose is to help fulfill the needs of transplant children and their families.

"When a transplant family comes to us, we recognize their needs are going to be continuous. We make a commitment to that family, keeping them in our care [if needed] up until the child is 18 years old," Garcia said.

Among the services TFC provide are financial assistance for transplant-related expenses, trust fund management, parent support through individual and group counseling, advocacy in insurance matters, crisis funding to meet extraordinary expenses, transportation and temporary housing assistance.

Garcia said, TFC's crisis fund provides money to meet families' 'life survival' needs. "We use the money to help them purchase prescriptions. Medicaid and insurance doesn't cover some of a child's medications."

She cited one case last year where TFC bought a special formula costing $60 for a boy to gain weight while awaiting a liver transplant. Family needs run the gamut from food to money for rent. TFC covers these and other extraordinary expenses.

"We don't turn any families away. There's no other organization in San Antonio that I'm aware of that caters specifically to the issue of child [organ] transplants, "Garcia said. TFC distinguishes itself from these organizations through its commitment to continuous care to adulthood.

Garcia, a bone marrow donor since 1986, said TFC currently helps 240 families. Her commitment to TFC is rooted in childhood when her father, Richard Garcia, was permanently incapacitated following a near fatal car accident in 1968. "We were overwhelmed by the response from our community [in Houston]. I know how important it was for my family to have the support of friends and the community," she said. **@**

T D S p o t l i g h t --

Sensors Directorate: facing the challenges of developing sensors in the 21st century

by Sensors Directorate

WRIGHT-PATTERSON AFB, OHIO — On May 5, Sensors Directorate people, with shovels in hand, literally dug in to shape their future by breaking ground on a $13.5 million Phase III addition to Building 620. This new addition will launch a major effort to implement the Air Force Research Laboratory's Collaborative Enterprise Environment (CEE), which will provide the framework on how the laboratory develops new technology for the 21st century warfighter.

Located next to the existing sensors research complex, the Phase III military construction project, known as Consolidated Sensors Laboratory, will consolidate widely separated laboratories and engineering workstations. The project will meet the requirement for the integration of sensors work being accomplished to support warfighters' sensor and information needs.

Phase III will provide approximately 62,000 square feet for automatic target recognition, sensor fusion and a collaborative engineering environment supporting technology development and weapon system demonstrations.

Under a banner of cooperation, the Sensors and Information Directorates are partnering in applying CEE to simulation-based acquisition in a laboratory environment for the development and demonstration of information and sensors technologies. The new addition will include a floor dedicated to the Information Directorate's collaboration science and simulation.

As the hub of an AFRL framework, it will tie together other major Air Force assets including the Aerospace Systems Center's Simulation and Analysis Facility, high performance computers in the Major Shared Resource Center and the Electronic System Center's Command and Control Unified Battlespace Environment.

As a major cultural change in the research and development process, the CEE concept involves applying state-of-the-art simulation and information technology to the way business is done. CEE enables partnerships among the laboratories, industry, and the war fighter to accelerate the development and transition of leading edge technology to operational weapons systems.

This kind of forward thinking has to be applied for the Sensors Directorate to meet future requirements of the warfighter. Especially if the directorate is to meet its vision to provide "a full range of affordable air and space sensors networked to the warfighter, that assure: complete and timely picture of the battle space; precision engagement of threats; and survivability of our own forces."

Pursuit of that vision is in the forefront of the directorate's engineers and scientists thinking as they face the challenges of the 21st Century. They have a simplistic view: to give the war fighter the best technology available to detect, identify and defeat any threat that might be encountered during future engagements. This challenge is being met by more than 700 scientists, engineers, and support personnel working in modern research facilities located at Wright-Patterson AFB, Ohio, Rome, New York and Hanscom AFB, Massachusetts.

Some of the high profile projects the directorate is pursuing to meet these challenges include Sensor Craft, Targets Under Trees and Infrared Countermeasures for Large Aircraft. These are just a few examples how the Sensors Directorate

(SEE SENSORS/PG.10)

BEGINNING THE WORK — Brigadier General Paul D. Nielsen (right corner) and members of the Sensors Directorate break ground on an addition to the Sensors laboratory. The addition will provide additional space for automatic target recognition, sensor fusion and a collaborative engineering environment supporting technology development and weapon system demonstrations.

Sensors

(continued from page 9)

is meeting the needs of the warfighter today and — for tomorrow's mission.

Sensor Craft is the visionary airborne component of a fully integrated air and space intelligence, surveillance, and reconnaissance (ISR) capability. Blending a wide spectrum of emerging technologies, Sensor Craft is an unmanned air vehicle (UAV) equipped with multiple advanced sensing devices that are actually integrated into the airframe. The Sensors Directorate is examining this innovative concept in collaboration with a multitude of partners. Considered an AFRL multi-directorate shared vision, the Sensor Craft combines critical emerging flight vehicle, propulsion, sensor, and information technologies into a highly responsive platform concept that provides revolutionary ISR capabilities to the warfighter.

This Sensor Craft will combine extremely long endurance with omni-directional sensing capabilities. The concept is to provide a "virtual presence" providing commanders with continuous and detailed information of the battlefield to include target detection, identification, and tracking. This unique combination of advanced sensors and sustained presence will allow commanders to react quickly and with greater precision to a dynamic combat environment.

Several aircraft and propulsion configuration are under study to determine the best possible tradeoffs among endurance, altitude, engine efficiency, and power generation.

The Sensor Craft configuration is driven by the needs of the advanced sensor payload, radio frequency, and electro-optical aperture requirements. These new sensing capabilities will result in continuous, all-weather, theater air and ground target acquisition, geo-location, and tracking of low observable and time-critical targets that may be concealed by foliage or camouflage.

While the Sensor Craft is part of a far-term solution for an integrated air and space ISR capability, technologies, which are currently available, are being evaluated to solve the near-term problem of targets hidden by camouflage or foliage. Under a study directed by the Air Force Chief of Staff, the Directorate, along with other partners, are examining sensor technology which can be moved quickly from the laboratory to provide the Air Force with an improved capability to find, identify, and engage mobile targets deployed in "deep hide."

IT'S A BIRD, IT'S A PLANE, NO IT'S... — Sensor Craft (pictured) is one of many high profile projects taking place at the Sensors Directorate. The sensorcraft is an unmanned air vehicle equipped with multiple advanced sensing devices actually integrated into the airframe.

Known as Targets Under Trees (TUT), AFRL is assessing several technologies including hyperspectral imaging, active laser sensing, unattended ground sensors and foliage penetration radar (FOPEN). While still examining a wide assortment of subsystem options and concepts of operation, a FOPEN radar system will be a central component of the eventual recommendation. An advance FOPEN radar system is already currently under development as a joint DARPA, Air Force and Army Advanced Technology Demonstration (ATD) program.

One major threat that Air Force is facing is small infrared missiles. The Sensors Directorate, cooperating closely with the Directed Energy Directorate, is researching laser solutions to protect military aircraft from shoulder mounted infrared guided missiles. The new era of guided missiles have longer ranges, better guidance, resist countermeasures and higher seeker sensitivity. Along with their effectiveness, they are relatively low cost.

The directorate is working to transition advanced technology for a directed laser jammer to defeat the IR missile threat. The Laser Infrared Flyout Experiment ATD supports countermeasure technology transition into Air Mobility Command's aircraft. The program is developing advanced technology that address all countermeasure requirements, which includes critical missile launch warning and the advanced countermeasures capability called Closed-Loop Infrared Countermeasures. This technology counters the missile by directing a high intensity modulated laser into the infrared seeker providing deceptive jamming effect on the guidance.

To be effective, the missile warning system must be capable of detecting and precisely handing off the position of a small infrared missile launch fired up to six kilometers away. The laser must be steered rapidly to engage the threat countering the missile's seeker. The entire engagement from launch to impact takes only seconds.

These programs are just a few of the challenges facing the directorate in the 21st Century. However, they demonstrate the directorate's resolve, working with all of its partners, to provide the warfighter with innovative state-of-the-art sensor technologies that enable revolutionary military capabilities. **@**

Net Index

Due to the number of submissions we receive, some sections of *news@**afrl*** are available exclusively on-line. The on-line version of the newsletter allows users to view the AFRL corporate calendar, news releases generated by AFRL headquarters, operating instructions, L@b L@urels and Roundups sections.

The L@b L@urels section of the electronic newsletter is dedicated to members of Air Force Research Laboratory who receive awards and honors. The Roundups section of the electronic newsletter keeps Air Force Research laboratory employees informed about contracts AFRL has awarded. Below is an index of articles one can find in each of these on-line sections.

L@b L@urels

- **UC Berkley appoints lab engineer as visiting scholar**

Yerkes

- **Air Vehicles professionals receive AIAA awards**
- **Laboratory professional wins small business award**
- **Forster named fellow for contributions to lubrication**
- **Propulsion Directorate scientist named AIAA fellow**
- **Propulsion professional receives environmental safety and health award**
- **Scientist receives IEEE award for tech transfer**
- **McAuliffe ends 'exemplary' career, receives medal**
- **Propulsions polymer group receives award for technology transfer**
- **Directorate's finest receive service, conduct medals**

Roundups

- **Innovation adds value to testbed, quickens Internet**
- **Lab's directorate teams for high-energy laser research**
- **Universities receive over $22 million from Rome lab**
- **Rome directorate research may transform telemedicine**
- **Tools provide security assurance, damage resilience**
- **Testbed analyzes system response to security attacks**
- **Research enhances counter-action against cyber attack**
- **Technology permits experts to record, reuse knowledge**
- **Technology will assist military planners, activities**
- **Planning, scheduling software to improve operation**
- **Lab contracts for maintenance on laser systems**
- **Lab to develop high-power microwave technologies**
- **Maui lab receives support for space surveillance**

To view the full text of these and other articles visit the *news@**afrl*** page on the Intranet.

To submit L@b L@urels or Roundups from your directorate, send a query to:

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